COMPARATIVE ACCOUNT OF BRAIN IN VERTEBRATES

Q.Mention important features of fish brain in due course of evolution.

The cerebrum of fishes consists of (1) a primitive sensory and association area (pallium, fig. 1a and b) that receives and processes input from the olfactory epithelium and, to a lesser degree, from the thalamus; and (2) a motor area, the subpallial globus pallidus, which receives projections from the pallium and from the thalamus and projects efferent fibers into descending tracts that innervate motor nuclei of cranial and spinal nerves.

Efferent impulses from the globus pallidus evoke reflex, survival-oriented responses of the muscles of locomotion and feeding.

Q.Establish one relationship between cerebrum of fish and amphibians.

Q.What do you mean by globus pallidus?

The **globus pallidus** is one of a group of striated nuclear masses known as the striatum in higher vertebrates. The arrangement of fiber tracts passing through the region is responsible for the striations.

The nuclei of the pallium and the globus pallidus persist **in tetrapods**, although eventually becoming subsidiary to more recently evolved nuclei **Amphibians.** The primitive pallium and globus pallidus that function in fishes are still prominent in amphibians, and they function in a similar relationship (fig. 1c).

Additional nuclei that have evolved in the **amphibian** subpallium enable the cerebrum to participate more extensively in coordinating incoming sensory inlormation and in directing responses to appropriate somatic musculature, which now includes an appendicular musculature that is more complex than that of fishes.

Q.Mention important features of Reptilian brain in due course of evolution.

The cerebrum of reptiles has become huge compared to that of amphibians.

The hemispheres now bulge laterally, dorsally, and backward over the diencephalon so that the thalamus is no longer visible from above (fig. 2, snake and chicken).

One of the factors responsible is a massive new area of association neurons, the dorsal ventricular ridge, in the lateral wall of the hemispheres. It increases considerably the bulk of the cerebrum and bulges into the lateral ventricle, converting the latter into a narrow slit (fig.1d).

The dorsal ridge receives visual, auditory, and general afferent somatic stimuli (table1) that have been relayed from the thalamus. The ridge processes this information and projects fibers to the globus pallidus and to other nuclei in the subpallium that constitute, collectively, the striatum.

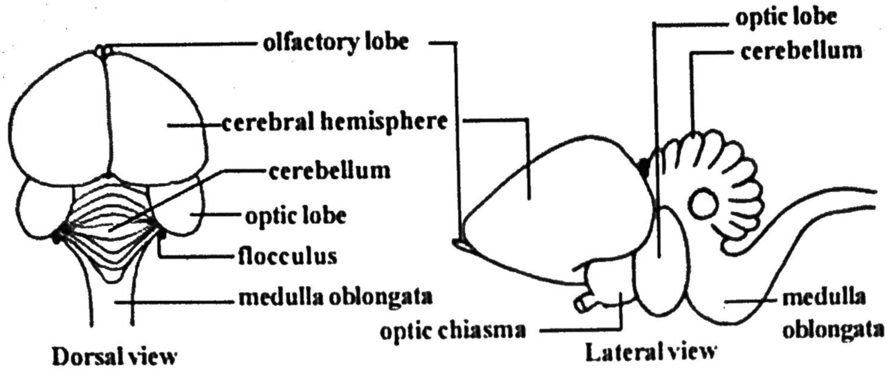
From there descending fiber tracts conduct efferent impulses to motor nuclei in the brain stem and cord, evoking somatic motor activity appropriate to the exigencies of the environment. Contributing also to the size of the reptilian hemispheres are the additional upper-level neurons necessitated by the musculature of the neck, a reptilian innovation, and especially of the limbs.

Since the days of the cotylosaurs, amniote limbs have supported the rest of the body above the ground; and. excepting limbless off- shoots, many reptiles have been capable of locomotion equal, or superior, to that of many mammals.

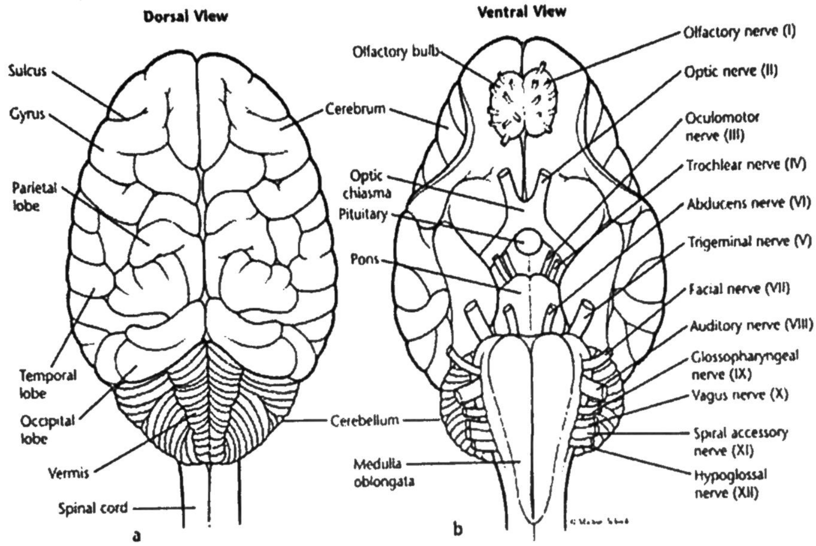
Q.Mention important features of Bird's brain in due course of evolution.

The cerebrum of birds is basically reptilian. The dorsal ridge has been inherited from reptiles, but another stratum of neurons has been added, capping the ridge (fig. 1e). The source of those neurons is unknown.

The eyes of birds, and especially birds of prey such as hawks and eagles, have unique specializaions, and the sensory input via the optic nerves is highly complex. The avian ridge collates and processes this intormation. Any other competence the avian ridge may have is speculative. It has been suggested that it may have a role in migration, homing, and stereotyped behavior such as nest building.



Pigeon



Rat

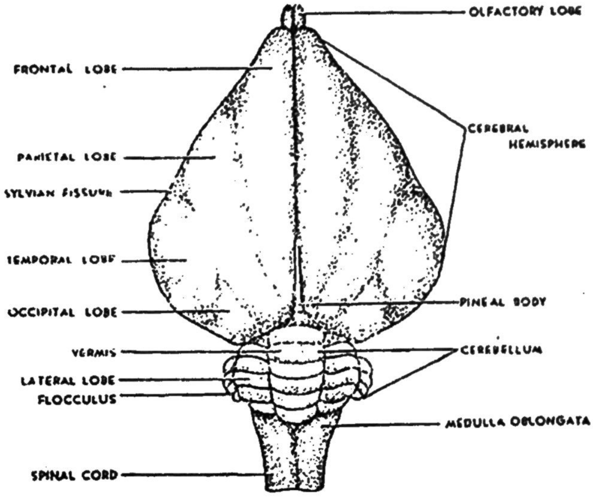


Fig. 160. Brain of Guinea-pig (dorsal view).

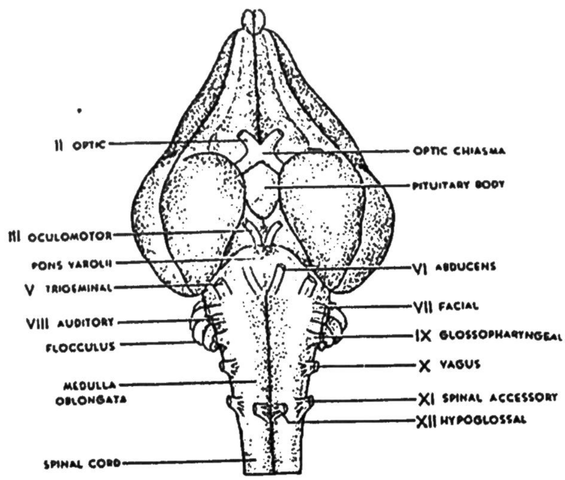


Fig. 161. Brain of Guinea-pig (ventral view).

Guineapig